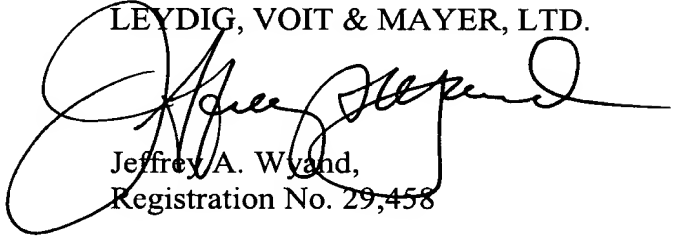


REMARKS

The foregoing amendments are made to correct minor translational errors and to meet United States requirements as to form. No new matter is added.

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

HOSONO et al.

Application No.: Unassigned Art Unit: Unassigned

Filed: June 4, 2001 Examiner: Unassigned

For: CARBON THIN
BODY, PROCESS
FOR PRODUCING
THE CARBON THIN
BODY, AND
ELECTRIC FIELD
EMISSION TYPE
ELECTRON SOURCE
USING THE CARBON
THIN BODY

**SPECIFICATION, CLAIMS AND
ABSTRACT AS PRELIMINARILY AMENDED**

Amendments to the paragraph beginning at page 2, line 2:

The use of the carbon-~~thin~~ body made of the carbon nanotubes as a planar electron source has been expanded. Because of its unique structure, however, it has been considered that the carbon-~~nanotubes~~ nanotube has-~~unknown~~ no known use.

Amendments to the paragraph beginning at page 2, line 6:

However, (a) carbon nanotubes are not formed unless the temperature of the substrate for them is raised to a given temperature or higher; (b) an expensive catalyst is required for forming nanotubes; (c) carbon nanotubes have small-~~adhesiveness~~ adhesion to the substrate owing to their structure; and (d) in the case that carbon nanotubes are used as a planar electron source, it is necessary to use a conductive substrate, or form the carbon nanotubes after a conductive film is formed on a nonconductive substrate since the

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respective nanotubes are electrically independent of each other. As shown in Fig. 27, in order to supply an electric current or voltage to perpendicularly-oriented carbon nanotubes 113 ~~in when the case that a~~ substrate 102 is ~~insulated~~ insulating, it is necessary to deposit a conductive film 105 on the substrate 102 and then form the perpendicularly-oriented carbon nanotubes thereon. The electric current or voltage is supplied from an electric current source or a voltage source to the conductive film 105.

Amendments to the paragraph beginning at page 2, line 20:

In the case that carbon nanotubes are used as a planar electron source, an inexpensive glass substrate cannot be used because of the substrate temperature referred to in ~~the~~ item (a). This hinders the use of carbon nanotubes, which are originally expensive. The drawbacks referred to in ~~the~~ items (b) and (d), together with the drawback referred to in ~~the~~ item (a), cause an increase in costs for making carbon nanotubes ~~to~~ for a planar electron source.

Amendments to the paragraph beginning at page 13, line 28:

Fig. 1 is a view of the front surface of a carbon thin body composed of an approximately netlike wall, which is observed with a scanning electron microscope (SEM) [~~20000X-magnifications~~ magnification];

Amendments to the paragraph beginning at page 13, line 31:

Fig. 2 is a perspective view of a cross section along the direction in which the carbon thin body shown in Fig. 1 grows, and the front surface side of the body, which are observed with a scanning electron microscope (SEM) [~~5000X-magnifications~~ magnification];

Amendments to the existing claims:

1. (Amended) A carbon-thin body that has a ~~given~~ thickness and is ~~in the form of~~ a thin layer having a front surface and a back surface, ~~wherein including at least in its at~~ the front surface portion a continuous curved wall is continuous, as ~~is~~ viewed in plan, ~~to form an approximately having a netlike structure.~~

2. (Amended) The carbon-thin body according to claim 1, wherein said curved wall ~~is arranged to approximately surround given~~ surrounds openings in a curved form, as ~~is~~ viewed in plan, ~~and substantially constitute as peripheral portions of said the openings.~~

3. (Amended) The carbon-thin body according to claim 1, including an object having a surface on which said carbon body is positioned ~~on a surface of an object~~, the back surface of said carbon-thin body contacting the surface of the object, and said curved wall standing up ~~in a standing wall form from said the~~ surface of the object.

4. (Amended) The carbon-thin body according to claim 1, wherein a base that occupies the back surface ~~side~~ within said carbon-thin body is ~~formed in~~ a continuous film ~~form to be embedded in said the~~ openings.

5. (Amended) The carbon-thin body according to claim 1, wherein said curved wall has a hexagonal-system crystal structure ~~and the~~ with a bottom plane of said hexagonal-system crystal is arranged in parallel to the a direction that crosses the front surface of said carbon-thin body.

6. (Amended) The carbon-thin body according to claim 1, wherein said curved wall has an average thickness of no more than 100 nm ~~or less~~.

7. (Amended) The carbon-thin body according to claim 1, wherein ~~its an~~ an electrical current can flow between any two points that are arbitrarily selected conduct electrically on the carbon body.

8. (Amended) The carbon-~~thin~~ body according to claim 3, wherein ~~said surface of~~ the object is a ~~surface of a~~ glass substrate.

9. (Amended) A process for producing a carbon-~~thin~~ body, including ~~the step of~~ using generating a plasma which is generated from in a gas containing a carbon compound and which applying a magnetic field and an electromagnetic wave are applied waves to, so as the plasma to form the carbon-~~thin~~ body on a surface of an object by chemical vapor-growth deposition, wherein ~~said the~~ magnetic field and the electromagnetic-~~wave~~ waves satisfy a resonance condition for electrons in ~~said the~~ plasma.

10. (Amended) The process for producing the carbon-~~thin~~ body according to claim 9, wherein the ~~direction of said magnetic field and the direction along which said electromagnetic-wave advances are~~ waves advance in a direction parallel to each other and cross said the magnetic field, crossing the surface of the object.

11. (Amended) The process for producing the carbon-~~thin~~ body according to claim 9, wherein ~~said the electromagnetic-wave is a microwave~~ waves are microwaves.

12. (Amended) The process for producing the carbon-~~thin~~ body according to claim 9, wherein ~~ingredient gases for generating said the plasma include a carbon-containing compound and hydrogen-gas, and the ratio of the hydrogen-gas in the ingredient-gases ranges~~ has a concentration range from 25% to 75%.

13. (Amended) The process for producing the carbon-~~thin~~ body according to claim 9, wherein ~~said surface of the object is a surface of a~~ glass substrate.

14. (Amended) The process for producing the carbon-~~thin~~ body according to claim 9, wherein ~~said surface of the object is heated at~~ no more than 700°C or lower.

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15. (Amended) An electric field emission type electron source, ~~wherein including~~ a carbon ~~thin~~ body ~~in which at least in its~~ having a front surface portion with a continuous curved wall ~~is continuous to have an approximately~~ having a netlike structure ~~is used as~~ an electron emitting member for emitting electrons ~~forward~~.

16. (Amended) The electric field emission type electron source according to claim 15, wherein ~~the diameter of wall surrounds openings surrounded by said wall in said approximately netlike structure is~~ and the openings have a diameter larger than the height of the wall.

17. (Amended) The electric field emission type electron source according to claim 15, ~~which includes~~ including a cathode pulling-out electrode for supplying electrons to said carbon ~~thin~~ body, and ~~a~~ an extraction electrode for generating an electric field ~~for emitting inducing emission of the electrons from the said carbon thin body,~~ wherein said carbon ~~thin~~ body is positioned ~~ahead in front of said the~~ cathode ~~pulling-out~~ electrode, contacting the ~~upper of said cathode pulling-out electrode, and said the~~ extraction electrode is positioned ~~ahead in front of the carbon thin body in the manner so that said the~~ extraction electrode does not overlap ~~with the carbon thin body, as is viewed in plan.~~

18. (Amended) The electric field emission type electron source according to claim 15, ~~which includes~~ including a cathode pulling-out electrode for supplying electrons to said carbon ~~thin~~ body, and a backside extraction electrode, positioned ~~in the~~ at a rear side of said carbon ~~thin~~ body, for generating, from the rear side, an electric field ~~for emitting inducing emission of the electrons from the said carbon thin body, wherein the cathode pulling-out electrode is positioned ahead in front of said the backside extraction electrode, and said carbon thin body is positioned ahead in front of the cathode pulling-out electrode, contacting the upper of the cathode pulling-out electrode.~~

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19. (Amended) The electric field emission type electron source according to claim 18, wherein ~~said the~~ cathode-pulling-out electrode is ~~arranged~~ located only in the at a periphery of said carbon-thin body.

20. (Amended) The electric field emission type electron source according to claim 18, wherein ~~said the~~ cathode-pulling-out electrode is positioned outside said the backside extraction electrode and not to overlap overlapping with said the backside extraction electrode as is viewed in plan.

Amendments to the abstract:

ABSTRACT OF THE DISCLOSURE

~~Obtained are a~~ A carbon-thin body having has a structure making it possible to ~~produce for producing~~ a planar electron source in a simple manner; a process for producing the carbon-thin body; and an electric field emission-type electron source using the carbon-thin body. ~~A The carbon-thin body that has a given thickness and is in the form of a thin layer having a front surface and a back surface, wherein and at least in the front surface-portion is a continuous curved wall is continuous, as is viewed in plan, to form an approximately having a netlike structure.~~

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BODY, PROCESS
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THE CARBON THIN
BODY, AND
ELECTRIC FIELD
EMISSION TYPE
ELECTRON SOURCE
USING THE CARBON
THIN BODY

CLAIMS PENDING AFTER PRELIMINARY AMENDMENT

1. A carbon body that has a thickness and is a thin layer having a front surface and a back surface, including at least at the front surface a continuous curved wall, as viewed in plan, having a netlike structure.
2. The carbon body according to claim 1, wherein said curved wall approximately surrounds openings in a curved form, as viewed in plan, as peripheral portions of the openings.
3. The carbon body according to claim 1, including an object having a surface on which said carbon body is positioned, the back surface of said carbon body contacting the surface of the object, and said curved wall standing up from the surface of the object.
4. The carbon body according to claim 1, wherein a base that occupies the back surface within said carbon body is a continuous film embedded in the openings.

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5. The carbon body according to claim 1, wherein said curved wall has a hexagonal crystal structure with a bottom plane parallel to a direction that crosses the front surface of said carbon body.
6. The carbon body according to claim 1, wherein said curved wall has an average thickness of no more than 100 nm.
7. The carbon body according to claim 1, wherein an electrical current can flow between any two points on the carbon body.
8. The carbon body according to claim 3, wherein the object is a glass substrate.
9. A process for producing a carbon body, including generating a plasma in a gas containing a carbon compound and applying a magnetic field and electromagnetic waves to the plasma to form the carbon body on a surface of an object by chemical vapor deposition, wherein the magnetic field and the electromagnetic waves satisfy a resonance condition for electrons in the plasma.
10. The process for producing the carbon body according to claim 9, wherein the magnetic field and the electromagnetic waves advance in a direction parallel to the magnetic field, crossing the surface of the object.
11. The process for producing the carbon body according to claim 9, wherein the electromagnetic waves are microwaves.
12. The process for producing the carbon body according to claim 9, wherein gases for generating the plasma include a carbon-containing compound and hydrogen, and the hydrogen has a concentration range from 25% to 75%.
13. The process for producing the carbon body according to claim 9, wherein the object is a glass substrate.

14. The process for producing the carbon body according to claim 9, wherein the object is heated at no more than 700°C.

15. An electric field emission type electron source, including a carbon body having a front surface with a continuous curved wall having a netlike structure as an electron emitting member for emitting electrons.

16. The electric field emission type electron source according to claim 15, wherein the wall surrounds openings and the openings have a diameter larger than height of the wall.

17. The electric field emission type electron source according to claim 15, including a cathode electrode for supplying electrons to said carbon body, and an extraction electrode for generating an electric field for inducing emission of the electrons from said carbon body, wherein said carbon body is positioned in front of the cathode electrode, contacting the cathode electrode, and the extraction electrode is positioned in front of the carbon body so that the extraction electrode does not overlap the carbon body, as viewed in plan.

18. The electric field emission type electron source according to claim 15, including a cathode electrode for supplying electrons to said carbon body, and a backside extraction electrode, positioned at a rear side of said carbon body, for generating, from the rear side, an electric field for inducing emission of the electrons from said carbon body, wherein the cathode electrode is positioned in front of the backside extraction electrode, and said carbon body is positioned in front of the cathode electrode, contacting the cathode electrode.

19. The electric field emission type electron source according to claim 18, wherein the cathode electrode is located only at a periphery of said carbon body.

20. The electric field emission type electron source according to claim 18, wherein the cathode electrode is positioned outside the backside extraction electrode and not overlapping with the backside extraction electrode as viewed in plan.

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